

THE IDENTITY OF SPADELLA MORETONENSIS JOHNSTON AND TAYLOR.

By J. M. THOMSON, C.S.I.R.O., Division of Fisheries, Cronulla, N.S.W.
(Received 25th November, 1952; issued separately, 22nd March, 1954.)

The benthic genus *Spadella* is not so well known as the more pelagic chaetognaths. The first record of the genus in Australia was the description by Johnston and Taylor (1919) of *Spadella moretonensis* from a single preserved specimen collected at low water mark at Caloundra, Moreton Bay. Mawson (1944) recorded three species of the genus, two of them new, from material dredged in water from 70 to 100 metres deep off the southern New South Wales coast. Thomson (1947) recorded *Spadella cephaloptera* (Busch) from one specimen taken in a vertical plankton haul in 20 metres inshore off Port Hacking.

Recently specimens of a species of *Spadella* were found to be abundant amongst the eel-grass (*Zostera marina*) in various parts of Moreton Bay, including the type locality of *Spadella moretonensis*. The species is very common on the mud-flats at Dunwich, Stradbroke Island. Specimens were kept alive for some time in aquarium jars enabling a more detailed inspection of the animals than was possible for Johnston and Taylor. The species was determined to be *Spadella cephaloptera* (Busch) 1851.

The measurements of 60 specimens are summarised in the following table:—

Length mm.	Tail %	Hooks no.	Ant. teeth no.	Post teeth no.	Maturity stages.			
					IV.	III.	II.	I.
6-7	52-55	9-10	3-5	0-1	% 100	%	%	%
5-6	50-54	8-10	2-4	0-1	20	80		
4-5	50-54	7-9	2-4	0-1		10	80	10
3-4	50-53	7-9	2-4	0-1			20	80
2-3	50-52	7-8	2-3	0-0				100

The maturity stages are distinguished as in Thomson (1947).

Specimens are short and robust. There is one pair of lateral fins the membranes of which pass around the seminal vesicles to merge with those of the tail fin. Anterior origin of lateral fins varies from a little in front of the receptaculum seminis on trunk segment to immediately behind lateral insertions of transverse septum. This level is anterior to anus which is anterior to the median portion of transverse septum and posterior to lateral insertions (figure 1). Both lateral and tail fins are rayed except for membranes which pass around the seminal vesicles. Tail fin spatulate rather than broadly rounded as in pelagic chaetognaths.

Hooks 7 to 10., anterior teeth 2 to 5; posterior teeth usually absent. Hooks or seizing jaws slender, with shaft bearing a spiral pattern, cutting edge smooth, point of hook sharp. Point inserted rather less than a quarter of its length into shaft. Anterior teeth rather long, slender and twisted. Posterior teeth when present, short and squat.

Corona ciliata somewhat variably shaped but always situated in neck region. Usually oval in shape with long axis transverse to long axis of body. Posterior margin of corona generally hollowed inwards.

Collarette well defined, commencing at anterior end of head; widest and most prominent in neck region, but extending to the receptula. Smaller specimens have a pair of prominent tentacles laterally on head at about level of eyes. These tentacles are not readily seen as they can be folded into slight grooves on the head. A pad of minute papillae is present antero-laterally each side of mouth.

Ovaries extend about two-thirds of length of trunk. In ripe condition, 3 to 10 large eggs are apparent. Seminal vesicles and receptula reniform in shape. Ventral transverse musculature present throughout trunk, prominent anteriorly.

As Yosii and Tokioka (1939) reported for Japanese specimens, the number of posterior teeth is fewer than that recorded for European specimens. This seems to be a common feature of several species which are present both in the Atlantic and the Pacific Oceans (see Johnston and Taylor (1919), Tokioka (1940) and Thomson (1947)). This difference cannot be accounted as having specific value. The complete absence of posterior teeth has not been recorded for European specimens, except by Moltschanoff (1909) for his *Spadella parvula*. John (1933) figured and mentioned in the text only one row (the anterior) in his description of specimens from the Plymouth region.

The spiral pattern of the shaft of the hooks has been recorded by Yosii and Tokioka (1939), but has not been mentioned by observers of Atlantic Ocean specimens. The short denticles on the cutting edge of the hooks reported by Ritter-Zahony (1911) are not apparent in the Moreton Bay specimens. Both John (1933) and Yosii and Tokioka (1939) record the cutting edge as smooth and sharp.

According to Ritter-Zahony (1911) the anterior teeth are long, slender and twisted along their length as described here. Yosii and Tokioka do not comment on this point, but their figure shows this condition. On the other hand, John (1933) in his detailed study of the species stated that the teeth are small, conical structures with pointed tips. Possibly this is a matter of terminology or of experience with the phylum, for John's figures show the teeth as relatively large for a chaetognath.

In life, the transverse septum between trunk and tail is directed posteriorly in the median line so that the anus opens posterior to the lateral insertions of the septum. However, in preserved specimens the gut appears to contract and the septum apparently is carried forward to the position figured by Johnston and Taylor (1919) and Yosii and Tokioka (1939). This may account for the doubt as to whether the lateral fins commence anterior to the tail segment, although in the many specimens examined from Moreton Bay the origin is variable. The collarette merges into the anterior end of the fin, making the rays difficult to detect. However, of the 60 specimens examined, 21 had the lateral fins commencing in front of the receptula seminis on the trunk segment, whereas in 39, these fins commenced on the tail segment immediately posterior to the septum. Where the insertion is anterior to the septum, this small, anterior portion does not flare more widely as in *Spadella schizoptera*.

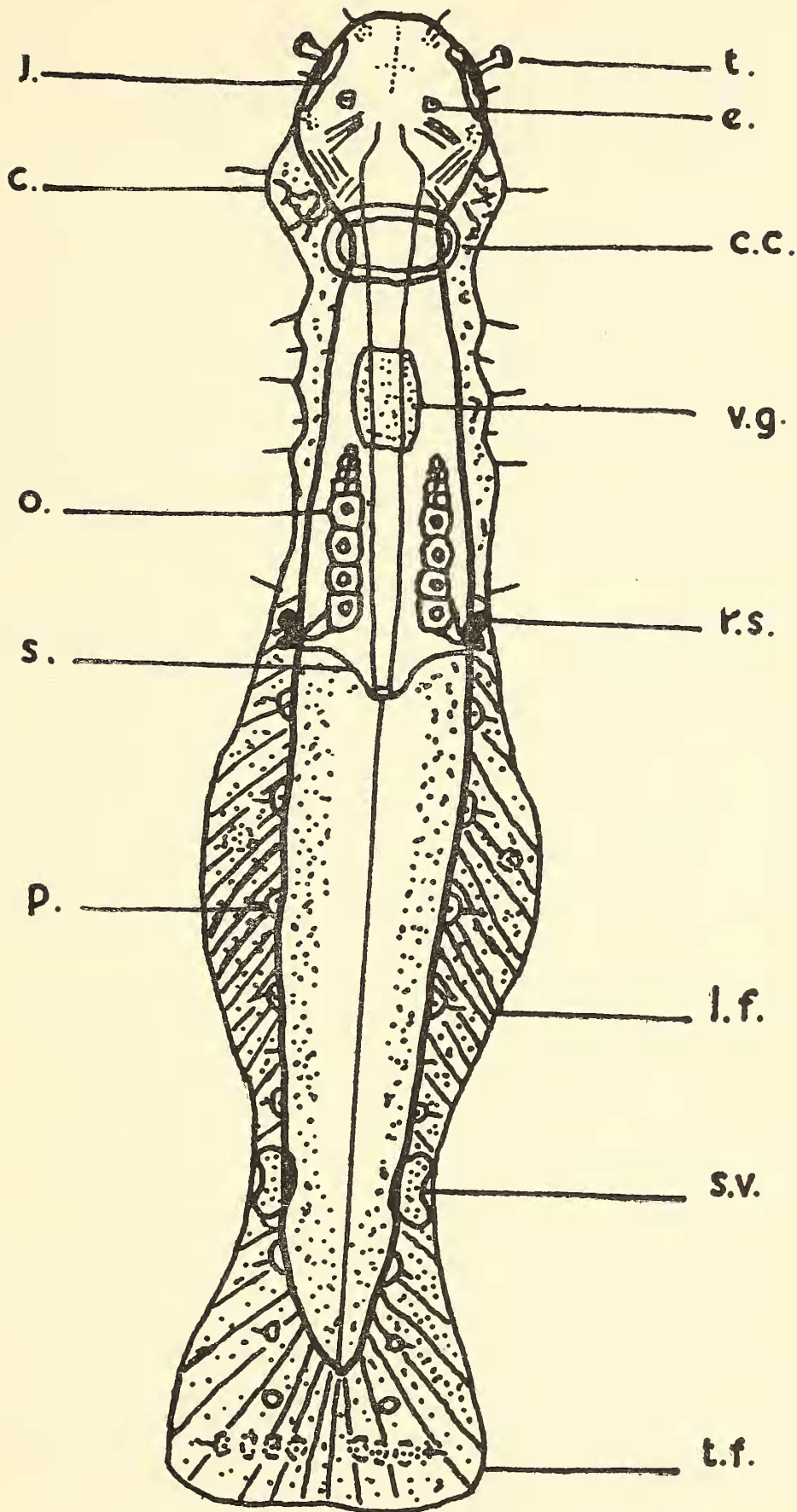


Figure 1. *Spadella cephaloptera*. Dorsal view.

a. anus; c. collarette; c.c. corona ciliata; e. eye; j. hooks; l.f. lateral fin; o. ovary; p. sensory papilla; r.s. receptaculum seminis; s. trunk-tail septum; s.v. seminal vesicle; t. tentacle; t.f. tail fin.

The distribution of the collarette is identical in Moreton Bay specimens with European examples. Johnston and Taylor (1919) were apparently misled by the remarks of Ritter-Zahony (1911a) "Collerette schon vor dem Halse beginnend, am breitesten in der Gegend der Corona, dann rasch sich verschmälernd, aber bis an die Mündung der Receptacula, also fast über den ganzen Rumpf reichend." However, in Ritter-Zahony's terminology "Rumpf" means the trunk segment, not the whole body.

The distinction made by Johnston and Taylor (1919) between the corona shape of *Spadella cephaloptera* and *S. moretonensis* is not of any significance because of the great variability in the outline of this structure. This has been commented on previously by John (1933) and Yosii and Tokioka (1939). Giard (1874) and Johnston and Taylor (1919) were in error in suggesting that the lateral tentacles reported by previous observers were foreign organisms. All specimens under 3.5 mm. bear them. John (1933) stated that they can be found in larger specimens retracted alongside the head, but careful examination has failed to reveal them. No specimen over 5 mm. in length was found to bear them.

Johnston and Taylor (1919) are probably in error in stating that transverse muscles occur in the tail in *moretonensis*. Their diagnosis was based on a solitary specimen, and there is no evidence from their text or figures that it was sectioned. It is most difficult to determine the presence of transverse muscle from external appearances. The longitudinal muscles are transversely striated and the contraction of the longitudinal band in the tail segment may cause superficial transverse striations which have the appearance of transverse muscle in external view (Yosii and Tokioka). Sectioning of Moreton Bay specimens failed to reveal transverse musculature in the tail.

The Moreton Bay specimens adhere to the surfaces upon which they rest by means of the adhesive papillae described by John. There are no glands associated with the papillae; the adhesion is entirely mechanical by the muscular creation of partial vacuua in the pits between the papillae. According to John (1933), the adhesive papillae occur only on the anterior third of the tail segment of adult *cephaloptera*, but in the newly hatched larvae they are said to occur only on the trunk and the head. The Moreton Bay specimens had adhesive papillae on at least the posterior third of the trunk segment as well as on the tail. Ritter-Zahony (1911, 1911a) and Kuhl (1938) both say merely that adhesive papillae occur on the ventral epitheleum without designating the limits of the adhesive area. Yosii and Tokioka (1939) were in error in considering the two club-shaped bodies found by Johnston and Taylor on the ventral surface of the posterior part of the tail as adhesive organs. Most probably they would be foreign bodies as suggested by Johnston and Taylor.

The lack of any clear difference between the specimens from Moreton Bay and the descriptions of *S. cephaloptera* from the north Pacific and the Atlantic Oceans leads to the conclusion that *Spadella moretonensis* Johnston and Taylor is a synonym of *Spadella cephaloptera* (Busch).

REFERENCES.

- BUSCH, W., 1851. Beobachtung uber Anatomie und Entwicklung einiger wirbellosen Seethiere. Berlin.
- GIARD, M., 1874. On the position of *Sagitta* and on the convergence of types by pelagic life. *Ann. Mag. Nat. Hist.*, (4) 16, 85-90.
- JOHN, C. C., 1933. Habits, structure and development of *Spadella cephaloptera*, *Quart. Journ. Micr. Sci.*, 75, 625-696.
- JOHNSTON, J. H., and TAYLOR, B. B., 1919. Notes on the Australian Chaetognaths. *Proc. Roy. Soc. Qld.*, 31, 28-41.
- KUHL, W., 1938. Chaetognatha, Bronn's Klassen. Ord. Tierreich, 4 (2), 1-226.
- MAWSON, P. M., 1944. Some species of the chaetognath genus *Spadella* from New South Wales. *Trans. Roy. Soc. South Aust.*, 68 (2), 327-333.
- MOLTSCHANOFF, L. A., 1909. Die Chaetognathen des Schwarzen Meeres. *Bull. Acad. St. Petersb.*, Ser. 6, 1887-902.
- RITTER-ZAHONY, R. V., 1911. Revision der Chaetognathen. *Deutsche Sudpolar Exped.*, 13 (5), 1-71.
- RITTER-ZAHONY, R. V., 1911. Die Chaetognathen der Plankton-Expedition. *Plankton Expedition*, 2, 1-33.
- THOMSON, J. M., 1947. The Chaetognatha of South-eastern Australia. *Counc. Sci. Indust. Res. Aust.*, Bull 222, 1-43.
- TOKIOKA, T., 1940. A small collection of Chaetognaths from coast of New South Wales. *Rec. Aust. Mus.*, 20 (6), 367-379.
- YOSII, N., & TOKIOKA, T., 1939. Notes on the Japanese *Spadella*. *Annot. Zool. Jap.* 18, 267-273.
-